

corresponding codeword value in the codeword vector. If not, the confidence weight of the codeword value in the matrix is decreased by the confidence weight of the codeword value in the vector in step 278.

If the confidence weight was decreased in step 278, then in step 280 that confidence weight is tested to see if it was decreased below zero. If the confidence weight is less than zero, then in step 282 the new codeword value in the codeword vector is substituted for the current codeword value in the corresponding location in the codeword matrix. The confidence weight assigned to the codeword value in the matrix is also changed to a positive value in step 284.

Finally, in step 286 the column number C is incremented by 1 for processing the next codeword value in the codeword vector and program control is returned to step 270 for repeating steps 272 through 286 for all of the columns in the vector.

Returning briefly to step 154 in FIG. 12, each time after the codeword matrix has been filled in with the new vector of codeword values and the confidence weights have been updated, an attempt is made to fill in the rest of the matrix using the built-in error correction capability of the symbol. The number and location of codewords which have not yet been successfully decoded may be determined by comparing the confidence weights assigned to each of the codeword values in the matrix with a predetermined threshold. Those values having confidence weights below the threshold are considered to not yet be decoded. If the number of codewords not yet decoded is less than the error correction capability of the symbol as determined by the security level, then an attempt is made to correct the matrix.

It will be apparent to those skilled in the art that various modifications and variations can be made in the decoding method and apparatus without departing from the scope or spirit of the invention. Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

What is claimed is:

1. An apparatus for decoding a two-dimensional bar code symbol, the bar code symbol including a plurality of ordered, adjacent rows of codewords of bar-coded information from a set of codewords, the set of codewords being partitioned into at least three mutually exclusive clusters, each row in the symbol having at least one row indicator codeword and containing only codewords from a cluster different from the codewords in an adjacent row, comprising:

means for scanning the two-dimensional bar code symbol to produce scan lines of data representing the bar-coded information in the codewords of the symbol;

means for decoding a scan line of data into a vector of codeword values corresponding to the codewords that were scanned, at least one of the codeword values being for a row indicator codeword;

means for assigning a row number to each of the codeword values in the vector based on the value of the row indicator codeword and the cluster of the codeword; and

means for filling in a codeword matrix with the codeword values in the vector according to their assigned row numbers.

2. The apparatus of claim 1, wherein the row indicator codewords contain information regarding the number of rows in the symbol and the number of codewords in each row, and wherein the apparatus further comprises

means for decoding a scan line of data to obtain a codeword value for a row indicator codeword, and means for determining one of the number of rows and the number of codewords in each row from the codeword value for the row indicator codeword.

3. The apparatus of claim 2, wherein each row of the symbol contains at least one of a start pattern and a stop pattern of bar-coded information, wherein the means for decoding a scan line of data to obtain a codeword value for a row indicator codeword includes means for locating a sequence of data in the scan line corresponding to one of the start pattern and the stop pattern.

4. The apparatus of claim 1, wherein the symbol contains at least one error correction codeword and the row indicator codewords contain information regarding the number of rows in the symbol, the number of codewords in each row, and the number of error correction codewords, and wherein the apparatus further comprises

means for decoding a scan line of data to obtain a codeword value for a row indicator codeword, means for determining a value for one of the number of rows, the number of codewords in each row, and the number of error correction codewords from the codeword value for the row indicator codeword,

means for adjusting a confidence weight for a corresponding one of the number of rows, the number of codewords in each row, and the number of error correction codewords based on the value determined in the preceding step and a previous value obtained by decoding a row indicator codeword, and

means for initializing the codeword matrix when the confidence weights for the number of rows, the number of codewords in each row, and the number of error correction codewords all exceed a predetermined threshold.

5. The apparatus of claim 4, wherein each row of the symbol contains at least one of a start pattern and a stop pattern of bar-coded information, and wherein the means for decoding a scan line of data to obtain a codeword value for row indicator codeword includes means for locating a sequence of data in the scan line corresponding to one of the start pattern and the stop pattern.

6. The apparatus of claim 1, wherein each row of the symbol contains at least one of a start pattern and a stop pattern of bar-coded information, and wherein the means for decoding a scan line of data into a vector of codeword values includes means for locating a sequence of data in the scan line corresponding to one of the start pattern and the stop pattern.

7. The apparatus of claim 1, further comprising means for assigning a confidence weight to each of the codeword values in the vector, and

means for adjusting a confidence weight of each of the corresponding codeword values in the matrix based on the codeword value in the vector and a current value of each of the corresponding codeword values in the matrix.